

# EKLAVYA UNIVERSITY, DAMOH (M.P.)

Scheme of Examination B.Sc I Year

*/For batch admitted in Academic Session 2020-21/*

*Subject wise distribution of marks and corresponding credits*

S. No.	Subject Name	Subject Code	Paper Name	Maximum Marks Allotted														Total Marks	Contact Periods Per week			Total Credits				
				Theory Slot					Practical Slot		Quiz/ Assignment/ Attendance	End Sem	Lab Work/ Sessional	L	T	P										
				Final Yearly		Half Yearly			End Sem	Lab Work/ Sessional																
				P1	P2	P3	P4	P1									P2		P3	P4						
1	Common	BAECC20Y101	Environmental and Disaster Management (University Core Under Ability Enhancement Course (AEC-1)	60				30										10			2	0	0	2		
				60				30												10			4	0	0	4
				-				-				-										60	40	2	0	0
2	Mathematics	BMATH20Y101	Algebra And Trigonometry - I (Core Course - 9A)	30				15										5			2	2	0	4		
		BMATH20Y102	Calculus and Differential Equations - II (Core Course - 9B)							15									5			2	1	0	3	
		BMATH20Y103	Vector Analysis and Geometry - III (Core Course - 9C)					30						15					5			2	1	0	3	
		BMATH20Y104	Discrete Mathematics - IV (Core Course - 9D for Honors)					30							15				5			3	2	0	5	
3	Common	BASPR20Y101	Assignment Presentation for 3 Core Courses																50	50	0	3	0	3		

**Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.**

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<b>Class</b>		<b>B.Sc. Mathematics</b>	
<b>Semester/Year</b>		<b>I Year</b>	
<b>Subject &amp; Subject Code</b>		<b>Mathematics-BMATH20Y101</b>	
<b>Paper</b>		<b>Algebra And Trigonometry-I</b>	
<b>Max. Marks</b>		<b>30 (ETE) + 20 (IA) =50</b>	
<b>Credit</b>		<b>Total Credits</b>	
<b>L</b>	<b>T</b>	<b>P</b>	<b>4</b>
2	2	0	
<b>Course Objectives:</b>			
<p>The course entitled "Algebra and Trigonometry" deals with the basic aspects of Algebra and Trigonometry. The contents of this course are inevitable for many branches of sciences. The students of Mathematics, Physics, Computer Science, Statistics, etc., are equally benefited with this course as a stepping stone to the broad areas of Algebra and Trigonometry. The course aims to provide foundations in Algebra and Trigonometry.</p>			
<b>Course Outcome:</b>			
<p>The Students will be able to:</p> <ol style="list-style-type: none"> <li>1. Work with matrices and determine if a given square matrix is invertible.</li> <li>2. Learn to solve systems of linear equations and application problems requiring them.</li> <li>3. Learn to compute determinants and know their properties.</li> <li>4. Learn to find and use eigenvalues and eigenvectors of a matrix.</li> <li>5. Learn about and work with vector spaces and subspaces.</li> <li>8. Learn how to work with some of the discrete structures.</li> <li>9. Students will formulate and model problems with the concepts and techniques of discrete mathematics.</li> </ol>			
<b>Student Learning Outcomes (SLO):</b>			
<p>Students will:</p> <ol style="list-style-type: none"> <li>1. Find the inverse of a square matrix.</li> <li>2. Solve the matrix equation <math>Ax = b</math> using row operations and matrix operations.</li> <li>3. Find the determinant of a product of square matrices, of the transpose of a square matrix, and of the inverse of an invertible matrix</li> <li>4. Find the characteristic equation, eigenvalues and corresponding eigenvectors of a given matrix.</li> <li>5. Determine if a given matrix is diagonalizable.</li> <li>6. Mathematical reasoning: Students are expected to use mathematical reasoning in order to read, comprehend, and construct mathematical arguments.</li> <li>7. Students will learn basic concepts of mathematical logic and proof.</li> <li>8. Understand how lattices and Boolean algebra are used as tools and mathematical models in the study of networks.</li> <li>9. Learn about truth tables.</li> <li>10. An ability to apply knowledge of computing and mathematics appropriate to the discipline.</li> </ol>			
<b>Unit</b>	<b>Syllabus</b>		<b>Periods</b>

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UNIT - I	Rank of a matrix, Normal & Echelon form of a matrix, Characteristic equation of a matrix, Eigen values, Eigen Vectors, Linear Independence of row and column matrix.	8
	आव्यूह की जाति, आव्यूह का प्रासामान्य एवं ऐसेलॉन रूप, आव्यूह का अभिलाक्षणिक समीकरण, आयगेन मान, आयगेन सदिश, पंक्ति एवं स्तम्भ आव्यूह की स्वतंत्रता ।	
UNIT - II	Cayley Hamilton theorem and its use in finding inverse of a matrix, application of matrix to solve a system of linear (homogeneous and non-homogeneous) equation, theorem on consistency and inconsistency of a system of linear equation, solving linear equation upto three unknowns.	8
	केली-हैमिल्टन प्रमेय एवं आव्यूह का व्युत्क्रम आव्यूह (समघात एवं असमघात) ज्ञात करने में इसका उपयोग, रैखिक समीकरणों के निकाय के हल के लिये आव्यूह का प्रयोग, रैखिक समीकरणों के निकाय की संगतता एवं असंगतता पर प्रमेय, तीन अज्ञात राशियों तक के रैखिक समीकरणों के हल ।	
Unit-III	Relation between the roots and coefficients of a general polynomial equation in one variable, Transformation of equation. Reciprocal equation, Descarts rule of signs.	8
	एक चर के सामान्य बहुपदों के समीकरण के गुणांकों एवं मूलों के बीच संबंध, समीकरणों का रूपांतरण, व्युत्क्रम समीकरण, चिन्हों का दिकार्ते नियम ।	
Unit-IV	Logic –Logical connectives, Truth Tables, Tautology, Contradiction Logical Equivalence, Algebra of properties, Boolean Functions, swithing circuits and its application, logic gates and circuits.	8
	तर्कशास्त्र – तर्क संयोजक, सत्यता सारणी, पुनरुक्ति और व्याघात, तार्किक तुल्यता, साध्यों का बीजगणित । बूलीय बीजगणित –परिभाषा एवं उसके गुणधर्म, बूलीय फलन, स्वचन परिपथ एवं उसके अनुप्रयोग, तर्कद्वार एवं परिपथ ।	
UNIT - V	De-Moiver's theorem and its applications, direct and inverse circular and hyperbolic functions, expansion of trigonometric functions, logarithm of complex quantities, Gregory's series, summation of trigonometrical series.	8
	डी-मोइवर्स प्रमेय एवं इसके अनुप्रयोग, प्रत्यक्ष एवं व्युत्क्रम वृत्तीय एवं अतिपरवयिक फलन । त्रिकोणमितीय फलनों का विस्तार, सम्मिश्र संख्याओं का लघुगुणक, ग्रीगोरी श्रेणी त्रिकोणमितीय श्रेणियों का योग ।	

**Text Books:**

- 1 Plane Trigonometry Part-II by S.L. Loney
- 2 Matrix and Linear Algebra, Prentice Hall of India Pvt.Ltd, New Delhi 2000 by K.B. Dutta
- 3 A Text book on Algebra and Theory of Equations, Pothishala Pvt. Ltd Allahabad by Chandrika Prasad.
- 4 Elements of discrete mathematics (second edition), Mc Graw Hill, International edition, Computer Science Series, 1986, by C.L. Liu .
- 5 म0प्र0 हिन्दी ग्रंथ अकादमी पुस्तके।

**References Books:**

- 1 H.S Hall and S.R. Knight-Higher Algebra H.M Publication, 1994
- 2 Jacobson-Basic Algebra Vol.I and II, W.H. Freeman.
- 3 I.S. Luther and I.B.S. Passi-Algebra Vol.I and II, Narosa Publishing House.
- 4 N.Saran and R.S. Gupta-Analytical Geometry of Three Dimension, Pothishala Pvt.Ltd. Allahabad.

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<b>Class</b>		<b>B.Sc. Mathematics</b>	
<b>Semester/Year</b>		<b>I Year</b>	
<b>Subject &amp; Subject Code</b>		<b>Mathematics-BMATH20Y102</b>	
<b>Paper</b>		<b>Calculus and Differential Equations-II</b>	
<b>Max. Marks</b>		<b>30 (ETE) + 20 (IA) =50</b>	
<b>Credit</b>		<b>Total Credits</b>	
<b>L</b>	<b>T</b>	<b>P</b>	<b>3</b>
2	1	0	

**Course Objectives:**

The objectives are to mentally prepare the students to learn Mathematics leading to graduate degree with honours in Mathematics or with Mathematics as a subject. These syllabi in Mathematics under CBCS are recommended keeping in view of the wide applications of Mathematics in science, engineering, social science, business and a host of other areas. The study of the syllabi will enable the students to be equipped with the state of the art of the subject and will empower them to get jobs in technological and engineering fields as well as in business, education and healthcare sectors.

**Course Outcome:**

The Students will be able to:

1. Evaluate first order differential equations including separable, homogeneous, exact, and linear.
2. Show existence and uniqueness of solutions.
3. Solve second order and higher order linear differential equations.
4. Create and analyze mathematical models using higher order differential equations to solve application problems such as harmonic oscillator and circuits.
5. Solve differential equations using variation of parameters.
6. Solve linear systems of ordinary differential equations.
7. Solve test of concavity and convexity.
8. solve cartesian and polar coordinate.

**Student Learning Outcomes (SLO):**

Students will:

1. Student will be able to solve first order differential equations utilizing the standard techniques for separable, exact, linear, homogeneous, or Bernoulli cases.
2. Student will be able to find the complete solution of a nonhomogeneous differential equation as a linear combination of the complementary function and a particular solution.
3. Student will be introduced to the complete solution of a nonhomogeneous differential equation with constant coefficients by the method of undetermined coefficients.
4. Student will be able to find the complete solution of a differential equation with constant coefficients by variation of parameters.
5. Student will have a working knowledge of basic application problems described by second order linear differential equations with constant coefficients.
6. Student will be able to solve expansions of Taylor's and Maclaurin's series.
7. Student will be able to solve tracing of curves in Cartesian and polar coordinates.

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Unit	Syllabus	Periods
UNIT - I	Successive differentiation, Leibnitz theorem, Maclaurins and Taylor's series expansions, Asymptotes.	8
	उत्तरोत्तर अवकलन, लैबनीज प्रमेय, मेक्लारिन एवं टेलर श्रेणी में विस्तार । अनंतस्पर्शी ।	
UNIT - II	Curvature, tests for concavity and convexity, points of inflexion, multiple points, tracing of curves in Cartesian and polar coordinates .	8
	वक्रता, उत्तलता एवं अवतलता का परीक्षण, नति परिवर्तन बिन्दु, बहुबिन्दु, कार्तीय एवं ध्रुवीय निर्देशांकों में वक्रों का अनुरेखण ।	
Unit-III	Integration of transcendent function , definite Integrals, Reduction formulae, Quadrature, Rectification.	8
	अबीजीय फलनों का समाकलन, निश्चित समाकलन, समानयन सूत्र, क्षेत्रकलन एवं चापकलन ।	
Unit-IV	Linear differential equations and equations reducible to the linear form, Exact differential equations, first order and higher degree equation solvable for X,Y, and P, Clairaut's equation and singular solutions , geometrical meaning of a differential equation, Orthogonal trajectories.	8
	रैखिक अवकल समीकरण एवं रैखिक समीकरण में समानेय अवकल समीकरण, यथातथ अवकल समीकरण एक्स, वाई, एवं पी में हल होने योग्य, प्रथम कोटि एवं उच्च घातीय अवकल समीकरण, क्लेरो का समीकरण और विचित्र हल । अवकल समीकरण का ज्यामितीय अर्थ, लांबिक संछेदियां ।	
UNIT - V	Linear differential equation with constant coefficients , Homogeneous linear ordinary differential equations, linear differential equations of second order , transformations of equations by changing the dependent variable /independent variable , method of variation of parameters .	8
	अचर गुणांको वाले रैखिक अवकल समीकरण , साधारण रैखिक समघात अवकल समीकरण, द्वितीय कोटि के रैखिक अवकल समीकरण, स्वतंत्र चर/ परतंत्र चर के परिवर्तन द्वारा समीकरणों का रूपांतरण, प्राचल विचरण विधि ।	

### Text ooks:

- 1 Differential Calculus,Pothishala Pvt. Ltd.,Allahabad by Gorakh Prasad.
- 2 Integral calculus,Pothishala Pvt.Ltd. Allahabad by Gorakh Prasad.
- 3 Introductory Course in Differential Equations, by D.A.Murray Orient Longman(India)1967
- 4 म०प्र० हिन्दी ग्रंथ अकादमी पुस्तकें।

### Reference Books:

- 1 Differential Equations,Tata Mc Graw Hill, by G.F.Simmons-1972.
- 2 An Introduction to irdinary differential Equation, Prentice Hall of India, by E.A. Codington 1961
- 3 Elementry Treatise on Differential Equations and their Application ,C.B.S. Publisher & Distributors,Delhi, by H.T.H. Piaggio –1985.
- 4 DifferentialEquations,Narosa Publishing House by S.G.Deo.

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<b>Class</b>		<b>B.Sc. Mathematics</b>	
<b>Semester/Year</b>		<b>I Year</b>	
<b>Subject &amp; Subject Code</b>		<b>Mathematics-BMATH20Y103</b>	
<b>Paper</b>		<b>Vector Analysis and Geometry-III</b>	
<b>Max. Marks</b>		<b>30 (ETE) + 20 (IA) =50</b>	
<b>Credit</b>		<b>Total Credits</b>	
<b>L</b>	<b>T</b>	<b>P</b>	<b>3</b>
2	1	0	

**Course Objectives:**

Course goals: To present the fundamental concepts of multivariable calculus and to develop student understanding and skills in the topic necessary for its applications to science and engineering.

**Course Outcome:**

The Students will be able to:

1. Define vector fields.
2. Calculate line integrals along piecewise smooth paths; interpret such quantities as work done by a force .
3. Use the fundamental theorem of line integrals.
4. Use Green's theorem to evaluate line integrals along simple closed contours on the plane.
5. Compute the curl and the divergence of vector fields.
6. Apply Stokes' theorem to compute line integrals along the boundary of a surface.
7. Use Stokes' theorem to give a physical interpretation of the curl of a vector field.
8. Use the divergence theorem to give a physical interpretation of the divergence of a vector field.
9. To get basic knowledge about Circle, Cone, Parabola, Hyperbola, Ellipse etc.
10. To understand the concepts & advance topics related to two & three dimensional geometry.
11. To study the applications of conics.
12. To study the application of Sphere, cone and cylinder.
13. To study how to trace the curve.

**Student Learning Outcomes (SLO):**

Students will:

1. Memorize definition of directional derivative and gradient and illustrate geometric meanings with the aid of sketches.
2. Memorize theorem relating directional derivative to gradient and reproduce proof.
3. Calculate directional derivatives and gradients.
4. Apply gradient to solve problems involving normal vectors to level surfaces.
5. Explain the concept of a vector integration a plane and in space.
6. understand geometrical terminology for paraboloid, ellipsoid, hyperboloid and circular cone.
2. measure angles using a protractor.
3. use geometrical results to determine unknown angles.
4. recognise line and rotational symmetries.
5. find the areas of cone, paraboloid,hyperboloid,ellipsoid and circles .

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Unit	Syllabus	Periods
UNIT - I	Product of four vectors, Reciprocal vectors, Vectors differential, Gradient, divergence and curl in Cartesian and cylindrical co-ordinates. Higher order derivatives, vector identities and vector equations .	8
	चार सदिशों का गुणन, व्युत्क्रम सदिश , सदिश अवकलन, कार्तीय एवं बेलनाकार निर्देशकों में ग्रेडियंट, डायवर्जेंस एवं कर्ल । उच्च कोटि अवकलज, सदिश समिकायें एवं सदिश समीकरण ।	
UNIT - II	Vector Integration, Theorem of Gauss, Green, Stoke and problems based on their application to geometry, curves in space, curvature and torsion, Serret, Frenet's formula.	8
	सदिश समाकलन, गॉस, ग्रीन एवं स्टोककी प्रमेय एवं इन पर आधारित प्रश्न। ज्यामिति में अनुप्रयोग, समष्टि में वक्र, वक्रता एवं मरोड़, सैरेट, फ्रेनेट सूत्र।	
Unit-III	General equation of second degree, tracing of conics , system of conics, polar equation of a conic.	8
	द्वितीय घात के व्यापक समीकरण, शांकवों का अनुरेखण, शांकव निकाय, शांकव का ध्रुवीय समीकरण।	
Unit-IV	Equation of cone with given base, generators of cone, condition for three mutually perpendicular generators, Right circular cone, equation of cylinder and its properties .	8
	दिए गए आधार पर शंकु का समीकरण, शंकु के जनक, तीन परस्पर लम्बवत जनकों हेतु प्रतिबंध, लम्बवृत्तीय शंकु, बेलन का समीकरण और इसके प्रगुण।	
UNIT - V	Central conicoids, Paraboloid, ellipsoid, hyperboloid of one and two sheets and their properties.	8
	केंद्रीय शांकवज, एक और द्वि पृष्ठीय के परवलयज, दीर्घवृत्तज, अतिपरवलयज एवं उनके गुणधर्म।	

#### Text Books:

- 1 Introduction to Vector Analysis , Pothishala Pvt. Ltd.,Allahabad by N.Saran and S.N Nigam.
- 2 Text Book on Coordinate Geometry,Pothishala Pvt. Ltd.Allahabad by Gorakh Prasad and H.C.Gupta.
- 3 Analytical Geometry of Three Dimension ,Pothishala,Pvt.Ltd. Allahabad by N.Saran and R.N.Gupta.

#### References Books:

- 1 Elementary Treatise on Coordinate Geometry of Three Dimensions Macmillan India Ltd.,by R.J.T.Bell 1994.
- 2 Theory and problems of Advance Calculus,Schaum Publishing Company,New York. by Muray R.Spiegel.
- 3 Vector Analysis,Schaum Publishing Company,New York by Muray R.Spiegel.
- 4 A Text Book of Vector Calculus,S.Chand & CO.New Delhi by Shanti Narayan.

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<b>Class</b>			<b>B.Sc. Mathematics (Honours)</b>		
<b>Semester/Year</b>			<b>I Year</b>		
<b>Subject &amp; Subject Code</b>			<b>Mathematics Honours-BMATH20Y104</b>		
<b>Paper</b>			<b>Discrete Mathematics -IV</b>		
<b>Max. Marks</b>			<b>30 (ETE) + 20 (IA) =50</b>		
<b>Credit</b>		<b>Total Credits</b>			
<b>L</b>	<b>T</b>	<b>P</b>	<b>5</b>		
3	2	0			
<p><b>Course Objectives:</b> The main objectives of the course are to:</p> <ul style="list-style-type: none"> <li>• Introduce concepts of mathematical logic for analyzing propositions and proving theorems.</li> <li>• Use sets for solving applied problems, and use the properties of set operations algebraically.</li> <li>• Work with relations and investigate their properties.</li> <li>• Investigate functions as relations and their properties.</li> <li>• Introduce basic concepts of graphs, digraphs and trees.</li> </ul>					
<p><b>Course Outcome:</b> The Students will be able to:</p> <ol style="list-style-type: none"> <li>1: Learn about partially ordered sets, lattices and their types.</li> <li>2: Understand Boolean algebra and Boolean functions, logic gates, switching circuits and their applications.</li> <li>3: Assimilate various graph theoretic concepts and familiarize with their applications. Analyze logical propositions via truth tables.</li> <li>4. Prove mathematical theorems using mathematical induction.</li> <li>5. Understand sets and perform operations and algebra on sets.</li> <li>6. Determine properties of relations, identify equivalence and partial order relations, sketch relations.</li> <li>7. Identify functions and determine their properties.</li> <li>8. Define graphs, digraphs and trees, and identify their main properties.</li> <li>9. Evaluate combinations and permutations on sets.</li> </ol>					
<p><b>Student Learning Outcomes (SLO):</b> Students will:</p> <ol style="list-style-type: none"> <li>1. Discuss definitions and diagram strategies for potential proofs in logical sequential order without mathematical symbols .</li> <li>2. Construct mathematical arguments using logical connectives and quantifiers. Verify the correctness of an argument using symbolic logic and truth tables.</li> <li>3. Construct proofs using direct proof, proof by contradiction, and proof by cases, or mathematical induction.</li> <li>4. Solve problems using counting techniques and combinatorics.</li> <li>5. Perform operations on discrete structures such as sets, functions, relations or sequences.</li> <li>6. Solve problems involving recurrence relations and generating functions.</li> <li>7. Construct functions and apply counting techniques on sets in the context of discrete probability.</li> <li>9. Apply algorithms and use definitions to solve problems to proof statements in elementary number theory.</li> </ol>					

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Unit	Syllabus	Periods
UNIT - I	Boolean function-disjunctive & conjunctive normal forms(canonical & dual canonical), Bool's expansion theorem, Equivalence classes & its relation, Composite relation, Equivalence relation, Equivalence classes & its properties, Partition of a set.	8
	बूलीय फलन- वियोजनीय एवं संयोजनीय प्रसामान्य रूप (केनोनिकल एवं डुअल केनोनिकल), बूल का विस्तार प्रमेय । संबंध- द्विचर संबंध, प्रतिलोम संबंध, संयोजित संबंध, तुल्यता संबंध , तुल्यता वर्ग एवं उसके गुण धर्म, समुच्चय का विभाजन ।	
UNIT - II	Partial order relation, Partially ordered sets, totally ordered sets, Hasse diagram, maximal and minimal element, first and last element, Lattice-definition and examples, dual lattice, bounded lattice, distributive lattice, complemented lattice.	8
	अंशतः क्रम संबंध, अंशतः क्रमित समुच्चय, एपूर्णातः क्रमित समुच्चय , हैसूह आरेख, उच्चिष्ठ एवं निम्ननिष्ठ , अवयव, प्रथम एवं अंतिम अवयव, जालक-परिभाषा एवं उदाहरण , द्वैत जालक , परिवद्ध जालक, वितरणीय जालक, पूरक जालक ।	
Unit-III	Graph-Definition, types of graphs, Subgraphs, walk, path, circuit, connected and disconnected graphs, Euler graph, Hamilton path and circuit, shortest path in weighted graph, Dijkstra's Algorithm for shortest paths.	8
	आलेख- परिभाषा एवं प्रकार, उप आलेख, गमन पथ एवं परिपथ, संबद्ध एवं असंबद्ध ग्राफ, आर्थलर ग्राफ, हेमिल्टोनियन पथ और परिपथ, भारित आलेख में लघुत्तम पथ हेतु डॉइजकस्ट्रा एल्गोरिथम ।	
Unit-IV	Tree's and its properties, Rooted tree, Binary tree, Spanning tree, Rank and nullity of a graph, Kruskal's Algorithm and Prim's Algorithm.	8
	वृक्ष एवं उसके गुण धर्म, नियत वृक्ष, द्विचर वृक्ष , जनक वृक्ष, आलेख की जाति एवं शून्यता, कुस्कल एवं प्राइम की एल्गोरिथम ।	
UNIT - V	Matrix representation of graphs-Incidence and Adjacency matrix, Cutset and its properties Planar graphs(definition), Kuratowski's two graphs.	8
	आलेख का आव्यूह निरूपण' इन्सीडेंस एवं एडजेन्सी आव्यूह, कटसेट्स एवं उसके प्रगुण प्लानर आलेख (परिभाषा), कुराटोव्स्की के द्विआलेख ।	

**Text Books:**

- 1 C.L.Liu.-Elements of Discrete Mathematics, Mc Graw Hill, New York
- 2 Narsingh Deo-Graph Theory, Prentice Hall.
- 3 म०प्र० हिन्दी ग्रंथ अकादमी की पुस्तकें ।

**References Books:**

- 1 M.K.Gupta Discrete Mathematics publisher Krishna Pvt. Ltd.
- 2 Discrete Mathematics (Schaum's Outlines) | Revised 3rd Edition.

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